TEST REPORT

Applicant:	TFIVE PTY LTD
Address:	10/29 Lorne Ave Killara NSW 2071 Australia
Equipment Type:	Smart Lock U100
Model Name:	SDL-D01 (refer section 2.4)
Brand Name:	Aqara
Test Standard:	Radiation Protection Series S-1 (refer section 3.1)
Sample Arrival Date:	Apr. 19, 2023
Test Date:	Apr. 20, 2023 - Apr. 26, 2023
Date of Issue:	Apr. 28, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Chen Huiming **Checked by:** Xiong Lining **Approved by:** Tu Lang (Testing Director)

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Apr. 28, 2023	Initial Issue

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	TFIVE PTY LTD
Address	10/29 Lorne Ave Killara NSW 2071 Australia

2.2 Manufacturer Information

Manufacturer	Lumi United Technology Co., Ltd.
Address	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Smart Lock U100
Model Name Under Test	SDL-D01
Series Model Name	DL-D01D
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and color. (this information provided by the customer)
Hardware Version	V2.1
Software Version	1.0.4_0007
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	PAIRDEER
	Model No.	LR6
	Serial No.	N/A
	Capacity	N/A
	Rated Voltage	1.5V
	Limit Charge Voltage	N/A

2.6 Technical Information

Network and Wireless connectivity	Bluetooth BLE Zigbee, NFC

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	Bluetooth, Zigbee	
Frequency Range	Bluetooth	2400 ~ 2483.5 MHz
	Zigbee	2400 ~ 2483.5 MHz
Antenna Type	Bluetooth	FPC Antenna
	Zigbee	FPC Antenna
Exposure Category	General Population/Uncontrolled Exposure	
EUT Type	Mobile Device	

3 STANDARD INFORMATION

3.1 Test Standards

No.	Identity	Document Title
1	Radiation Protection Series S-1(Rev. 1)	Radiation Protection Series S-1(Rev. 1) Standard for Limiting Exposure to Radiofrequency Fields - 100 kHz to 300 GHz
2	AS/NZS 2772.2:2016+AMD1:2018	Australian/New Zealand Standard Radiofrequency fields Part 2: Principles and methods of measurement and computation—3 kHz to 300 GHz
3	Radiocommunications Equipment (General) Rules 2021	Radiocommunications Equipment (General) Rules 2021

4 DEVICE CATEGORY AND LEVELS LIMITS

The field calculation does not take into account the antenna size, which is assumed to be a point source. An ideal isotropic antenna is used as a reference to compare the performance of practical antennas: ***P*** watts is radiated, from a point, uniformly over the surface of sphere of radius ***r***. The POINTING VECTOR gives the power density:
Assumed use distance from EUT to Human, **20 cm** separation distance warning is required. In this section, the power density at 20 cm location is calculated to examine if it is lower than the limit.

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = power density
P = output power (W)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = Separation distance between radiator and human body (m)

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the following limits.

Compliance criteria
The worst case maximum exposure levels (Non Occupational) are given in Table 7 of the ARPANSA standard as shown belwo. The limits are given as Reference Levels which vary with the frequency. The General Public exposure category is applicable for this report.

ARPANSA Standard, Table 4: Reference levels for whole body exposure, averaged over 30 minutes, to RF electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms values)

Exposure Category	Frequency range	Incident E-field Strength Einc (V m-1)	Incident H-field Strength Hinc (A m-1)	Incident Power Density Sinc (W m-2)
Occupational	0.1 - 6.943 MHz	ES	4.9 / f_M	N/A
	6.943 - 30 MHz	660 / $f_M^{0.7}$	4.9 / f_M	N/A
	30 – 400 MHz	61	0.16	10
	400 – 2000 MHz	3 x $f_M^{0.5}$	0.008 × $f_M^{0.5}$	f_M / 40
	2 – 300 GHz	N/A	N/A	50
General Public	0.1 – 6.27 MHz	ES	2.2 / f_M	N/A
	6.27 – 30 MHz	300 / $f_M^{0.7}$	2.2 / f_M	N/A
	30 – 400 MHz	27.7	0.073	2
	400 – 2000 MHz	1.375 × $f_M^{0.5}$	0.0037 × $f_M^{0.5}$	f_M / 200
	2 – 300 GHz	N/A	N/A	10

Note:

1. ‘NA’ signifies ‘not applicable’ and does not need to be taken into account when determining compliance.
2. ‘ES’ signifies that no reference level is available, as it would be greater than the reference level for spatial peak and temporal peak field strengths based on electrostimulation effects shown in Table 7.
3. f_M is frequency in MHz.
4. S_{inc}, E_{inc} and H_{inc} are to be averaged over 30 minutes, over the whole-body space. Temporal and spatial averaging of each of E_{inc} and H_{inc} must be conducted by averaging over the relevant square values (see ICNIRP 2020a for details).
5. For frequencies of 100 kHz to 30 MHz, regardless of the far-field/near-field zone distinctions, compliance is demonstrated if neither E_{inc} nor H_{inc} exceeds the above reference level values.
6. For frequencies of >30 MHz to 2 GHz:
   a) within the far-field and radiating near field zones: compliance is demonstrated if either S_{inc}, E_{inc} or H_{inc}, does not exceed the above reference level values (only one is required); S_{eq} derived from either E_{inc} or H_{inc} may be substituted for S_{inc};
   b) within the reactive near-field zone: compliance is demonstrated if both E_{inc} and H_{inc} do not exceed the above reference level values; S_{inc} cannot be used to demonstrate compliance, and so basic restrictions must be assessed.
7. For frequencies of >2 GHz to 300 GHz:
   a) within the far-field and radiating near field zones: compliance is demonstrated if S_{inc} does not exceed the above reference level values; S_{eq} derived from either E_{inc} or H_{inc} may be substituted for S_{inc};
   b) within the reactive near-field zone, reference levels cannot be used to determine compliance, and so basic restrictions must be assessed.

5 MPE ASSESSMENT

5.1 Output Power

Bluetooth	
Mode	BLE
EIRP (dBm)	8.8
Note: This report listed the maximal case power value, please refer to BL-SZ2340760-601 report for more details.	

Zigbee	
Mode	O-QPSK
EIRP (dBm)	8.6
Note: This report listed the maximal case power value, please refer to BL-SZ2340760-602 report for more details.	

5.2 Assessment Result

Mode	Max. EIRP (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (W/m²)	Limit of Power Density (W/m²)	Power Density/ Limit	Verdict
Bluetooth	8.80	2.0	20	0.015	10.000	0.002	Pass
Zigbee	8.60	2.0	20	0.014	10.000	0.001	Pass

Collocated Power Density Calculation

Evolution mode	Frequency (MHz)	Power Density/Limit	Σ(Power Density / Limit) of Bluetooth + Zigbee	Verdict
Bluetooth	2402	0.0020	**0.003**	Pass
Zigbee	2405	0.0010		Pass

Note:

1. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power Density limit)], for Bluetooth + Zigbee.
2. Both of the Bluetooth/Zigbee can transmit simultaneously, the formula of calculated the Power Density is
   CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1
   CPD = Calculation power density
   LPD = Limit of power density
3. The worst-case situation is 0.003, which is less than “1”. This confirmed that the device comply with Council Recommendation 1999/519/EC Power Density limit.
4. More power list please refer to RF test report.

5.3 Conclusion

This EUT is deemed to comply with the reference level limits by Council Recommendation Radiation Protection Series S-1 therefore the basic restrictions are compliant with human exposure limits.

Statement

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--END OF REPORT--